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ATTRITION OF LODGEPOLE PINE SNAGS ON THE SLEEPING CHILD BURN, MONTANA

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ABSTRACT

Following 2 years with little windthrow, snags on the Sleeping Child Burn fell at an annual rate of 13.4 percent. Snags less than 3 inches d.b.h. fell at a rate of 27.9 percent and nearly all were down in 15 years. Snags larger than 3 inches fell at an annual rate of 8.4 percent, but those larger than 8 inches fell sporadically. At current rates, all snags will fall within the next 40 years; however, a few larger snags with a lower probability of windthrow will stand indefinitely.

KEYWORDS: fire effects, salvage logging, windthrow, snag fall

The rate at which snags fall is of interest to land managers for a number of reasons. Drying checks may reduce the value of snags for sawtimber (Mielke 1950), but "... the actual loss by direct burning is seldom more than 3 percent of the gross volume" (Boyce 1961). As long as they remain standing, snags represent some real or potential value for pulpwood, house logs, firewood, and wildlife habitat. Standing snags may also increase the hazard of lightning-caused fires but, once on the ground, snags increase the fuel load and become subject to discoloration and decay.

As a part of a study of postfire vegetal succession on the Sleeping Child Burn, Bitterroot National Forest (Lyon 1976), I examined snag attrition by periodically counting the number of standing snags on eight transects located at elevations between 6,400 and 7,200 feet within the 28,000-acre burn. Each transect consisted of 10 permanently located circular plots, 23.55 feet in radius (0.04 acre), spaced at 50-foot intervals.² Standing snags were recorded in four diameter (breast high) classes: under 3, 3 to 8,

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²Conversion to metric units requires the following constants:

Acres X 0.405 = hectares
Feet X 0.305 = meters
Density/acre X 2.471 = density/hectare
Inches X 2.540 = centimeters

8 to 12, and over 12 inches. Initial data were taken 1 year after the fire in 1962, and counts were repeated in 1963, 1966, 1969, 1971, and 1976.

Snag species were not recorded, but lodgepole pine (*Pinus contorta*) was the dominant tree species. In general, stems under 3 inches in diameter were subalpine fir (*Abies lasiocarpa*) and all others were lodgepole pine with the exception that the few very large snags (over 12 inches) were Douglas-fir (*Pseudotsuga menziesii*) and Engelmann spruce (*Picea engelmannii*).

RESULTS

Postfire snag densities ranged from 240 to 918 stems per acre on the eight sample transects (table 1). There was no way to identify snags that remained standing during the fire and then fell before the first count in 1962. However, I have assumed that most of the initial fall did occur during or immediately after the fire and that the 1962 average of 497 snags per acre was representative of initial snag densities in 1961. Confirmation of an extremely low attrition rate for at least 2 years was also suggested by the just over 1 percent loss between 1962 and 1963.

After the second postfire year, snag fall increased substantially. Nearly half of all snags had fallen by the fifth season, and only 28 percent were standing in the 10th year. After 15 years, barely 15 percent were still standing (table 2). The average annual attrition rate for the last 13 years of the study was 13.4 percent, but this result is somewhat misleading because snags under 3 inches had a much higher rate than larger stems (fig. 1). (Attrition rate, as used in this paper, is the annual percentage loss of snags upright at the beginning of the year. A 10 percent annual attrition for 10 years would leave nearly 35 percent of the original stems still standing.) While only 1.4 percent of the small snags remained standing in 1976, over 30 percent of the snags greater than 3 inches in diameter were still upright.

Attrition rates for small snags were relatively consistent among transects and constant through the years. After two seasons of less than 1 percent annual loss, snag fall averaged 27.9 (18 to 33) percent of those still standing each year for 13 years. Snags 3 to 8 inches in diameter also had a constant, but far lower, attrition rate of 8.4 (6 to 10) percent after the initial 2 years of minor loss. For snags over 8 inches, these data suggest a somewhat less predictable pattern. Following 2 years of about 2 percent annual windthrow, attrition averaged 8.6 percent for 13 years. However, fall of snags over 8 inches was sporadic rather than constant. Because data were not taken annually, I cannot confirm large windthrow in any single year, but the alternating periods of high and low attrition suggest a possibility of 20 to 30 percent windthrow mixed with years of almost no loss.

Table 1.--Numbers of snags per acre on each of eight transects by year of count

Transect	Year					
	1962	1963	1966	1969	1971	1976
SC01	498	498	393	343	333	258
SC02	390	383	188	160	123	73
SC04	423	413	190	145	110	68
SC08	240	240	148	83	38	15
SC09	693	685	403	268	203	75
SC10	918	918	358	160	95	28
SC11	570	565	265	170	108	35
SC12	243	223	198	160	118	53
Average	497	490	268	186	141	75

Table 2.--Average number of snags per acre by size class and year of count.
(Totals may not agree because of rounding.)

Size class (inches)	Year					
	1962	1963	1966	1969	1971	1976
Under 3	266	265	96	41	28	4
3 to 8	159	156	124	103	85	50
8 to 12	64	62	40	36	24	19
Over 12	7	7	7	6	4	3
Total	497	490	268	186	141	75

For all snags over 3 inches in diameter, average annual attrition on different transects ranged from 1.4 to 14.7 percent. The number of samples available is considered inadequate to justify a definitive conclusion, but there is some suggestion that windthrow probabilities are slightly lower on northerly aspects (transects 1 and 4) and at higher altitudes (transects 1 and 2). There was no indication that slope or snag densities influenced windthrow rates.

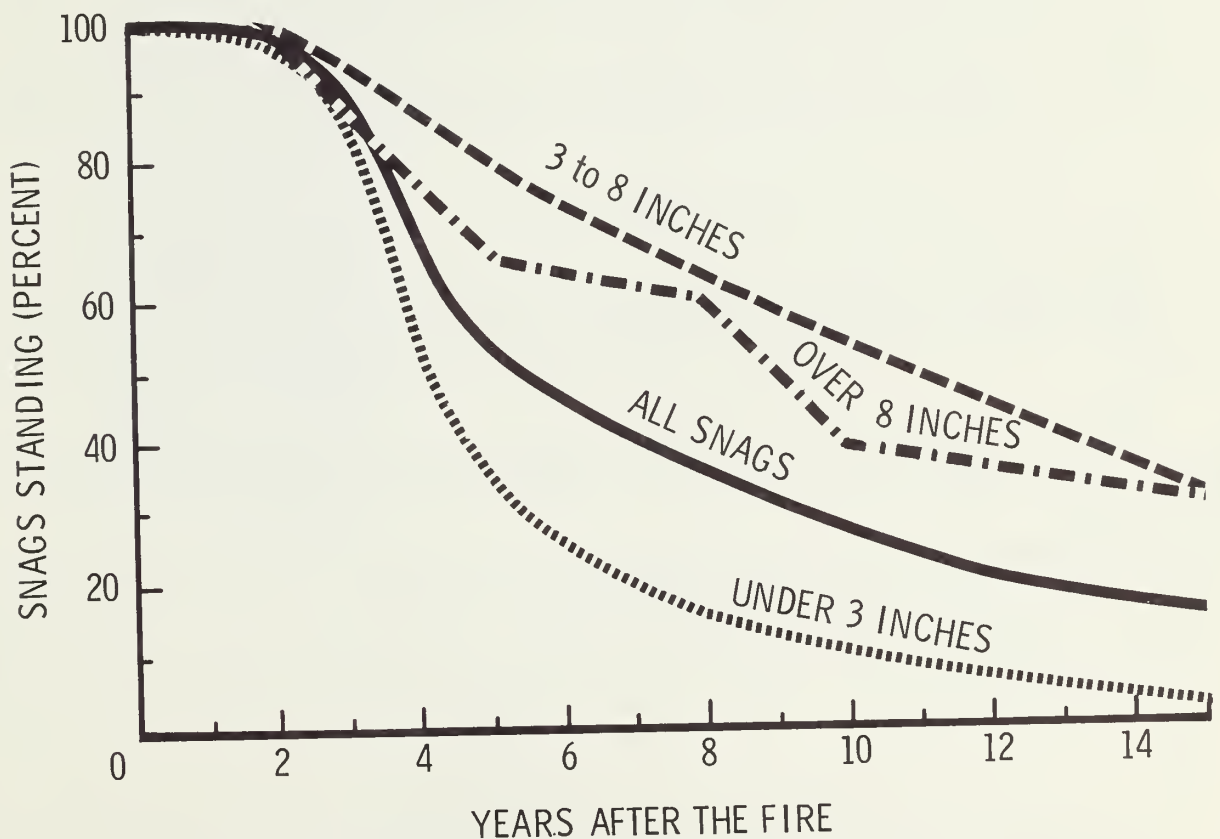


Figure 1.--Percentage of snags still standing, by year and diameter class, Sleeping Child Burn, 1962-1976.

DISCUSSION

Two previous papers on snag deterioration have described decay and windthrow of merchantable beetle-killed Engelmann spruce (Mielke 1950; Hinds and others 1965). In both reports, the majority of stems were of larger diameter than the snags on the Sleeping Child Burn. However, these studies were also done in high altitude forests, and some comparisons are thus possible.

Mielke (1950) counted Engelmann spruce in Utah and found that only 16 percent had dropped after 25 years. For stems 3 to 7 inches in diameter, annual attrition was 0.92 percent and for snags greater than 8 inches annual attrition was 0.69 percent. Another paper (Hinds and others 1965), from Colorado, shows annual attrition of 5-inch and larger Engelmann spruce ranging from 0.6 to 2.5 percent for periods up to 23 years. This paper also reports one sample of beetle-killed lodgepole pine with an annual attrition below 2 percent for 17 years. Average diameter of these snags was 12 inches, which may partially explain the low attrition rate as compared to the smaller snags on the Sleeping Child Burn. However, it is also logical to propose that snag attrition rates in fire-killed timber are inherently higher because there are no live trees remaining to reduce wind velocities.

SUMMARY AND CONCLUSIONS

Following 2 years with very little windthrow, snags on the Sleeping Child Burn fell at an annual rate of 13.4 percent. Snags less than 3 inches in diameter had an almost constant attrition rate of 27.9 percent and were virtually gone in 15 years. All snags larger than 3 inches fell at an annual rate of 8.4 percent, but stems larger than 8 inches seemed to fall sporadically rather than at a constant rate. At the current rate of attrition, all snags on the burned area will fall within the next 40 years. However, because larger snags have a lower probability of windthrow, a few will stand indefinitely.

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